



UNITED STATES PATENT AND TRADEMARK OFFICE

JAN
UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/766,494	01/28/2004	Shilin Chen	074263.0208 (SC98026 CON2)	3485
31625	7590	11/17/2005		EXAMINER
BAKER BOTTS L.L.P. PATENT DEPARTMENT 98 SAN JACINTO BLVD., SUITE 1500 AUSTIN, TX 78701-4039			JONES, HUGH M	
			ART UNIT	PAPER NUMBER
			2128	

DATE MAILED: 11/17/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/766,494	CHEN, SHILIN	
	Examiner Hugh Jones	Art Unit 2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 29 June 2005.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-36 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 28 January 2004 is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) Notice of References Cited (PTO-892)
- 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
 Paper No(s)/Mail Date 1/28/04, 9/8/04, 12/15/04, 1/31/05,
- 4) Interview Summary (PTO-413)
 Paper No(s)/Mail Date. _____.
- 5) Notice of Informal Patent Application (PTO-152)
- 6) Other: _____.

DETAILED ACTION

Introduction

1. Claims 1-36 of U. S. Application 10/766,494, filed on 1/28/2004 are presented for examination.

Interference

2. Applicant have requested that Examiner declare an Interference (dated 1/28/2004) against U. S. Application 10/443,196. Claims 1-36 of this application are alleged by applicant to correspond to claims 1, 3-7, 14-15, 18, 20, 22-24, 27, 31-33, 36, 42-44, 47, 51-53, 56, 63-64, 67, 71-73, 76, 78, 84, 96 of U.S. Application 10/443,196.

3. The Examiner has relied upon § 1.603 (Interference between applications; subject matter of the interference):

“Before an interference is declared between two or more applications, the examiner must be of the opinion that there is interfering subject matter claimed in the applications which is patentable to each applicant subject to a judgment in the interference. The interfering subject matter shall be defined by one or more counts. *Each application must contain, or be amended to contain, at least one claim that is patentable over the prior art and corresponds to each count.* All claims in the applications which define the same patentable invention as a count shall be designated to correspond to the count.”

4. Claims 1, 3-7, 14-15, 18, 20, 22-24, 27, 31-33, 36, 42-44, 47, 51-53, 56, 63-64, 67, 71-73, 76, 78, 84, 96 of this application have been copied by the

applicant from U. S. Application 10/443,196. These claims are not patentable to the applicant because of the claim rejections, subsequently presented.

5. An interference cannot be initiated since a prerequisite for interference under 37 CFR 1.603 is that at least one claim be patentable to the applicant subject to a judgement in the interference.

Drawings

6. Figures 10-12 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Figure 10 discloses a prior art drill rig; figure 11 discloses a prior art roller cone bit; figure 12 discloses a prior art drag bit. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Priority

7. Applicant's claim for the benefit of a prior-filed application under 35 U.S.C. 119(e) or under 35 U.S.C. 120, 121, or 365(c) is acknowledged. Applicant has not complied with one or more conditions for receiving the benefit of an earlier filing date under 35 U.S.C. [1] as follows:

8. The later-filed application must be an application for a patent for an invention which is also disclosed in the prior application (the parent or original nonprovisional application or provisional application). The disclosure of the invention in the parent application and in the later-filed application must be

sufficient to comply with the requirements of the first paragraph of 35 U.S.C. 112.

See *Transco Products, Inc. v. Performance Contracting, Inc.*, 38 F.3d 551, 32 USPQ2d 1077 (Fed. Cir. 1994).

9. The disclosure of the prior-filed application, Application No. 60,098,442, fails to provide adequate support or enablement in the manner provided by the first paragraph of 35 U.S.C. 112 for one or more claims of this application. There is insufficient support for most of the claim limitations, including, for example, optimization modeling/designing.

Claim Objections

10. Claims 2-5, 7, 9, 11-34, 36 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. The independent claim is drawn to an apparatus, namely, a drill bit. The dependent claims are drawn to bit design parameters, which are not connected, in the claim, to the apparatus. There is no limitation directed to designing the drill bit; instead, there is a limitation reciting a bit design parameter with no nexus to the claimed drill bit.

11. Furthermore, claim 1 is objected to under 37 CFR 1.75(c), for similar reasons, due to the presence of the last limitation. The last limitation of claim 1 recites:

"at least one bit design parameter selected so that
the cutting elements wear in a selected manner when drilling
an earth formation."

The independent claim is drawn to an apparatus, namely, a drill bit. The last limitation of claim 1 is drawn to bit design parameters, which are not related, by claim language, to the apparatus.

Claim Rejections - 35 USC § 112

12. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

13. **Claims 1-36 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.** The last limitation of the independent claim is ambiguous and not understood. The dependent claims inherit the defect:

- the last limitation of claim 1 recites:

"at least one bit design parameter selected so that
the cutting elements wear in a selected manner when drilling
an earth formation."

The independent claim is drawn to an apparatus, namely, a drill bit. The last limitation of claim 1 and dependent claims 2-5, 7, 9, 11-34, 36 are drawn to bit design parameters, which are not related, by claim language, to the apparatus. There is no limitation directed to designing the drill bit; instead, there is an

unrelated limitation reciting a bit design parameter with no nexus to the claimed drill bit.

Double Patenting

14. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees.

See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

15. A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

16. Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

17. Claim 1 is rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over patented claim 1 of U.S. Patent No. 6,401,839. Claim 1 is anticipated by patented claim 1 in that patented claim 1 contains all the limitations of claim 1 of the instant

application. Claim 1 of the instant application therefore is not patentably distinct from the earlier patented claim and as such is unpatentable for obviousness-type double patenting.

18. Consider pending claim 1, for example:

A drill bit comprising: a bit body; at least one roller cone attached to the bit body and able to rotate with respect to the bit body; and a plurality of cutting elements disposed on the at least one roller cone, at least one bit design parameter selected so that the cutting elements wear in a selected manner when drilling an earth formation.

Compare to patented claim 1:

A roller cone bit comprising: A plurality of on-axially-symmetric teeth mounted on rotatable elements, wherein ones of said teeth which follow the same path on a cutting face have different axial orientations, herein a first plurality of said ones of teeth are contiguous and all have a first orientation, and a second plurality of said ones of said teeth are contiguous and all have second orientation, hereby the likelihood of tracking is reduced.

Claim Interpretation

19. The subsequent prior art rejections are asserted in view of the following claim analysis.

20. The claims do not invoke 112(6) paragraph ("means for" or "step for").

This follows from analysis of the claims and from Applicant's statement in the specification (lines 28-32, page 22):

"None of the description in the present application should be read as implying that any particular element, step, or function is an essential element which must be included in

the claim scope: THE SCOPE OF PATENTED SUBJECT MATTER IS DEFINED ONLY BY THE ALLOWED CLAIMS. Moreover, none of these claims are intended to invoke paragraph six of 35 USC section 112 unless the exact words "means for" are followed by a participle."

21. Note that 112 rejections and claim objections have been applied against the claims. MPEP section 2173.06 (Prior Art Rejection of Claim Rejected as Indefinite) addresses the issue of applying prior art against such claims:

... Second, where there is a great deal of confusion and uncertainty as to the proper interpretation of the limitations of a claim, it would not be proper to reject such a claim on the basis of prior art. As stated in In re Steele, 305 F.2d 859, 134 USPQ 292 (CCPA 1962), a rejection under 35 U.S.C. 103 should not be based on considerable speculation about the meaning of terms employed in a claim or assumptions that must be made as to the scope of the claims. The first approach is recommended from an examination standpoint because it avoids piecemeal examination in the event that the examiner's 35 U.S.C. 112, second paragraph rejection is not affirmed, and may give applicant a better appreciation for relevant prior art if the claims are redrafted to avoid the 35 U.S.C. 112, second paragraph rejection.

22. There is a great deal of confusion and uncertainty as to the proper interpretation of the limitations of all claims, and thus it would not be proper to reject such a claim on the basis of prior art. However, in the interests of compact prosecution, such an interpretation will be nonetheless provided. Specifically, a prior art rejection is applied against all dependent claims, in anticipation that Applicants will rectify the claim deficiencies related to the issue of whether whether all dependent claims further limit the intervening claims.

Claim Rejections - 35 USC § 102

23. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

24. **Claim 1 is rejected under 35 U.S.C. 102(b) as being clearly anticipated by Ma ("The operational mechanics of the rock bit").**

25. Ma et al. ("The operational mechanics of the rock bit" – 1996 - *of record*) discloses:

A drill bit comprising: a bit body; at least one roller cone attached to the bit body and able to rotate with respect to the bit body; and a plurality of cutting elements disposed on the at least one roller cone, at least one bit design parameter selected so that the cutting elements wear in a selected manner when drilling an earth formation.

(Ma: "The operational mechanics of the rock bit" – 1996 - *of record* discloses: ***optimal roller bit design using computer simulation*** (chapter 6) based on the entire teachings in the book, including ***operational mechanics of the roller bit geometry*** (details in chapter 2); ***kinematics of the bit*** (details in chapter 3); ***rock-bit interaction*** (details in chapter 5); and ***bit design including force analysis*** (see page 232: "evaluate the size, load, motion, stress, and strain of each part...").).

Claim Rejections - 35 USC § 103

26. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

27. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

28. **Claims 2-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ma (“The operational mechanics of the rock bit”) in view of [Warren et al.] and in further view of Applicant’s prior admission (background of the invention).**

29. Ma et al. discloses the limitations as discussed including optimal design.

30. **Ma et al. (1996) do teach optimal design but do not expressly teach that the optimal design consists of**

- balancing the volume cut over the three rollers;
- balancing the forces over the three rollers;
- maximizing the drill rate/lifetime;

Art Unit: 2128

- some specifics of the bit; for example, whether it is made of tungsten carbide.

31. Warren et al. disclose **teach that the issues relating to bit imbalance were well known and studied in the prior art for at least the last decade.**

Warren et al. further teach the dependence of drill penetration rate on relative force balance.

In particular, note col. 1, line 28 to col. 2, line 21:

"Numerous studies have been made to find out what causes such destruction to the cutting elements. The inventors hereof have previously found that a substantial portion of the destructive forces are generated by radial imbalance forces that cause a drill bit to rotate about a rotational axis offset from the geometric center of the drill bit in such a way that the drill bit tends to wobble or "backwards whirl" about the borehole. This backwards whirling causes the center of rotation to change dramatically as the drill bit rotates about the borehole. Thus, the cutting elements travel faster, sideways, and backwards and thus are subject to greatly increased impact loads which cause the destruction of the cutting elements."

More specifically, circumferential drilling imbalance forces exist to some degree on every drill bit and these forces tend to push the drill bit towards the side of the borehole. In a typical drill bit, gauge cutting elements are designed to cut the edge of the borehole. During the cutting process, the effective friction between the cutting elements near the gauge area increase and, thus, the instantaneous center of rotation becomes some point other than the geometric center of the drill bit. When this happens, the usual result is for the drill bit to begin to backwards whirl around the borehole. This whirling process regenerates itself because sufficient friction is always generated between the drill bit gauge area and the borehole wall, no matter what the orientation of the drill bit, from the centrifugal forces generated by the rapid acceleration of the drill bit.

Various methods and equipment have been proposed to eliminate or reduce these imbalance forces, including using dynamically balanced lower drill string assemblies and very precisely aligning the cutting elements to reduce imbalance forces.

Various designs of drill bits have been developed to improve penetration rates by aligning the cutting elements in a plurality of equal radius sets, with each set being in

Art Unit: 2128

overlapping radial relationship. One such drill bit design is disclosed in U.S. Pat. No. 4,545,441. Further, various attempts at improving cutting element life have been made by varying the back or side rake or angle of attack of the cutting elements, i.e., the angle at which the face of the cutting element addresses the formation with respect to the formation surface. The benefits of varying such back rake angles are disclosed in "The Effect Of Back Rake On The Performance Of Small-Diameter Polycrystalline Diamond Rock Bits: ANOVA Tests," Journal of Energy Resources Technology, Vol. 108, No. 4, pp. 305-309, December 1986; U.S. Pat. No. 4,660,659; U.S. Pat. No. 4,440,247; U.S. Pat. No. 4,186,628 and U.S.S.R. Pat. No. 395,559. The effects of varying side rake angles is disclosed in Hunnj SPE-10152 (1981).

There is no disclosure or suggestion in any of the above-identified article or patents of arranging cutting elements specifically to prevent or reduce the effects of destructive bit whirl. **There is a need for a drill bit design which incorporates features designed specifically for preventing bit whirl and improving cutting element life."**

32. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify the teachings of Ma et al. to consider as optimal design such a design wherein the forces and volumes are balanced among rollers and further to maximize the drill rate for the following reasons. It was well known in the art at the time of the invention to those of ordinary skill in the art that a pervasive problem in the industry was that of unbalanced forces on bits resulting in drill bit whirl further resulting in a decrease of drill penetration rate.

33. It inherently follows that for an optimal condition wherein the forces were balanced among rollers; that the volume of earth cut among the rollers would also be balanced. There is a direct and inherent (as well as obvious) relationship between energy, drill rate, applied force and resultant removed volume of formation and is a consequence of Newton's laws of motion.

Art Unit: 2128

34. As per limitations directed at specifics such as: wherein the cutting element material comprises tungsten carbide; wherein the cutting elements are formed from at least two different materials; wherein at least one of the at least two different materials comprises a hardfacing material; wherein the at least one bit design parameter comprises a number of cutting elements; and wherein the at least one bit design parameter comprises a hardness of a cutting element material; Applicants have admitted that these specific bit design parameters were common parameters (background of the invention) in bit design.

35. Any inquiry concerning this communication or earlier communications from the examiner should be:

directed to: Dr. Hugh Jones telephone number (571) 272-3781,

Monday-Thursday 0830 to 0700 ET,

or

the examiner's supervisor, Kamini Shah, telephone number (571) 272-2279.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist, telephone number (703) 305-3900.

mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(703) 308-9051 (for formal communications intended for entry)

or (703) 308-1396 (for informal or draft communications, please label PROPOSED or DRAFT).

Art Unit: 2128

Dr. Hugh Jones
Primary Patent Examiner
November 11, 2005

HUGH JONES Ph.D.
PRIMARY PATENT EXAMINER
TECHNOLOGY CENTER 2100